19. $f(x) = \dfrac{x}{x^2+1}$

$0 = \dfrac{(x^2+1)(1) - x(2x)}{(x^2+1)^2}$

$= \dfrac{x^2+1-2x^2}{(x^2+1)^2}$

$= \dfrac{-x^2+1}{(x^2+1)^2}$

$0 = \dfrac{-x^2+1}{(x^2+1)^2}$

$0 = \dfrac{(x^2+1)^2(-2x) - (-x^2+1)2(x^2+1)2x}{(x^2+1)^4}$

$\dfrac{(x^2+1)\left[(x^2+1)(-2x) - 4x(-x^2+1)\right]}{(x^2+1)^4}$

$\dfrac{2x(x^2-3)}{(x^2+1)^3}$

$f'(-2)$ $-$ -1 $f'(0)$ $+$ $f'(2)$ $-$

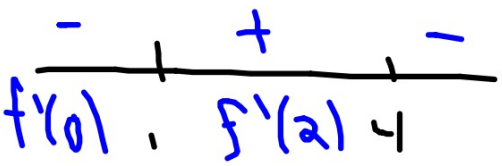
$f'(-2)$ $-$ $-\sqrt{3}$ $f(-1)$ $+$ $f'(1)$ 0 $f'(1)$ $+$ $\sqrt{3}$ $f'(2)$ $-$

15. $f(x) = x(x-4)^3$

$x\left(1x^3(-4)^0 \; 3x^2(-4)^1 \; 3x^1(-4)^2 \; 1(-4)^3\right)$

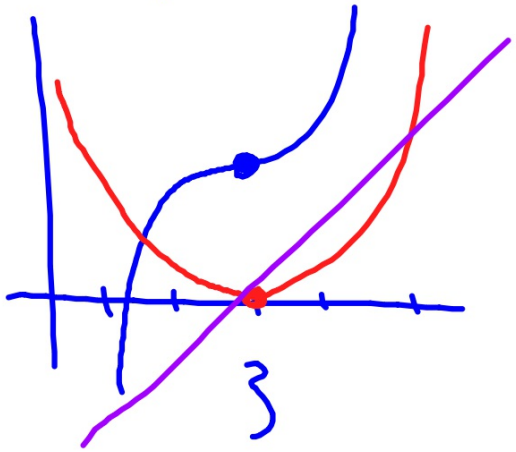
$x^4 - 12x^3 + 48x^2 - 64x$

$0 = 4x^3 - 36x^2 + 96x - 64$



3.4 B

A. Graphical Analysis



Inc: $(-\infty, 3) \cup (3, +\infty)$

Concavity

D: $(-\infty, 3)$

U: $(3, +\infty)$

Ex. $f(-2) = f(0) = f(3) = 0$

$f'(x) > 0 \quad x < -1 \text{ , } x > 2$

$f'(x) < 0 \quad -1 < x < 2$

$f''(x) < 0 \quad x < 0$

$f''(x) > 0 \quad x > 0$

7.195 27, 29, 31 → Draw

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